MEMORANDUM

TO: Toni Jones, Charlene Spells, Ketan Patel U.S. Environmental Protection Agency

FROM: Kristen James, Jason Huckaby, and Amber Allen, Eastern Research Group, Inc.

DATE: April 26, 2010

SUBJECT: CISWI Test Data Database

1.0 INTRODUCTION

This memorandum summarizes the information collection activities and data standardization procedures used to develop the Commercial Industrial Solid Waste Incinerators (CISWI) unit database. The database discussed in this memorandum reflects the data utilized in preparation of the proposed regulations. The EPA received additional data late last year and early this year, but due to the court-ordered deadline, did not have sufficient time to review and evaluate the additional data and revise the analyses. EPA intends to review the additional data submitted from a quality assurance and completeness perspective and incorporate that data into the final standards, as appropriate. To the extent the Agency receives additional emissions data during the comment period, the Agency will assess that data as it develops the final emission standards.

Section 2.0 summarizes the data collection efforts and Section 3.0 discusses the procedures used to reconcile duplicates and standardize the reported data. Appendix A contains a list and brief description of the tables contained in the CISWI database and Appendix B provides a table showing the data conversions used to standardize emission units.

2.0 DATA COLLECTION

The initial database of CISWI units operating in the United States as of 1998 was obtained from the information collected to support EPA's Industrial Combustion Coordinated Rulemaking (ICCR). In 2006, the list of CISWI units initially identified was distributed to 10 EPA regional offices to confirm whether the units were operational. Based on the information supplied by the EPA Regions, the initial CISWI database was revised to reflect the unit deletions/additions provided by the Regional contacts. The regions also provided emissions test reports, as available.

In 2008, CISWI units for which EPA regional offices did not have any information were included in EPA's Combustion Survey (ICR No. 2286.01). This "Phase I" survey requested that facilities provide information concerning any operating CISWI units (e.g., location of unit, contact person, emissions, fuel type, waste type, and controls). Data from the Phase I survey

were reviewed to include only data for incinerators or energy recovery units that were currently in operation and are expected to be in operation at the CISWI rulemaking compliance date. EPA used the data collected from the ICR Phase I survey to update the inventory of CISWI units and identify gaps in emissions test data.

In May of 2009, the Agency distributed EPA's Test Plan for Boilers, Process Heaters, and Commercial Industrial Solid Waste Incinerators (ICR No. 2286.03) to targeted facilities. For CISWI units, the targeted facilities were each unique CISWI unit within EPA's understanding of the proposed solid waste definition and the units that would be considered CISWI as a result of the definition. This "Phase II" survey asked facilities to conduct emission tests for pollutants where emissions data were missing from the Phase I database. Facilities submitted emissions test reports using various means including hard copies of stack test reports, ERG Excel spreadsheet template files, and EPA's Electronic Reporting Tool (ERT).

Based on the responses to the Phase I and II surveys, the CISWI database was revised to reflect previously unidentified units, units that were no longer operational, and units that were not considered to be CISWI units for the reasons shown below:

- The unit burned on-spec used oil only.
- The unit was shutdown (Conditional Exemption) and the facility indicated that it does not plan to operate the unit in the future.
- The unit was a metals recovery unit.
- The unit no longer burns waste.
- The unit was a hazardous waste unit under SWDA 3005.
- The unit was classified as an OSWI unit (e.g., animal crematory).
- The unit qualifies as a small power production facility or qualifying cogeneration facility and is statutorily exempt under section 129 of the Clean Air Act.
- The unit is a cogeneration unit.
- The unit is government-owned and should be classified as an OSWI.

In addition to the revisions made to the database to incorporate the Phase I and II survey responses, units were removed from the CISWI database based upon direct communications between the facility and EPA representatives.

Some units in the inventory were not required to conduct emissions tests as part of the Phase II survey. Very small units, smart ash units, and identical units to those already identified for testing at a facility were not required to be tested. Emissions data are not available for the units that were not required to test unless a facility voluntarily submitted additional data for a unit listed in the database.

EPA's solid waste definition rule proposes to define which non-hazardous secondary materials that are used as fuels or ingredients in combustion units are solid wastes under Subtitle D of RCRA. In addition to the primary proposed approach set forth in the Solid Waste Definition rule, the rule solicits comments on an alternative approach for determining which secondary materials are solid waste under Subtitle D of RCRA, when combusted. Therefore, two separate databases were created from the revised database to facilitate EPA's rulemaking

decisions: the Proposed Approach Database, and the Alternative Approach Database. These databases contain information for waste-firing units as defined in the proposed and alternative definitions of the solid waste definition rule.

3.0 DATA STANDARDIZATION PROCEDURES

3.1 ICR Phase II Data Hierarchy

For some CISWI units, emissions data were reported in the Phase II survey using both the Microsoft ® Excel spreadsheet templates and the EPA's ERT. To avoid duplicate records in the CISWI emissions database, the following hierarchical approach was developed to determine which data to incorporate into the database:

1. If a test report summary (either hard or electronic copy) and an electronic data summary (either ERT or Microsoft ® Excel spreadsheet template) were provided, the electronic data summary was used in the emissions database to minimize data entry and processing time.
2. If the Microsoft ® Excel spreadsheet template and an ERT file contained data for the same pollutant, the Microsoft ® Excel spreadsheet template was used to populate the emissions database.
3. If the respondent did not provide a Microsoft ® Excel spreadsheet template for a pollutant, the ERT data was used in the emissions database.
4. After the data from the ERT and Microsoft ® Excel spreadsheet templates were consolidated, any pollutants with negative or zero values or suspected outliers for high or low emission rates were compared to the hard copy and electronic files to confirm these questionable values. If the test report had values that differed from the ERT or Microsoft ® Excel spreadsheet templates, the data from these test reports replaced the ERT and Microsoft ® Excel spreadsheet template data in the database. The reported emissions data for each unit on the test list were also reviewed for any pollutants not reported in the ERT or Microsoft ® Excel spreadsheet templates. These data gaps were reviewed to determine if fuel or material analysis data were used in lieu of stack testing or if EPA had granted a testing waiver for certain pollutants (such as for certain burn-off ovens). If the data were found to be missing, the stack test reports were reviewed, and used to populate the database.

3.2 Data Standardizations

Most of the fields presented in each table of the database were taken directly from the Microsoft ® Excel spreadsheet templates or ERT files as populated by the respondent. However, additional data fields were added to the database to standardize the various types of qualitative and quantitative data reported. These fields allowed for analysis of the raw data while maintaining a record of the data as originally reported. Further, seeing the reported data alongside the analyzed data facilitated the process of quality assurance (QA) on the standardized fields. Finally, a few fields in the *Data:Emissions Tests* table of the database were added to the

CISWI database and were populated during data extraction from stack test reports submitted by the facility.

3.2.1 Emissions Test Data

Before the emissions data contained in the CISWI database could be evaluated, the data reported by facilities were converted into the following standardized units of measure (see Appendix B for data conversion tables):

- Parts per million by volume on a dry basis, corrected to 7 percent oxygen (ppmvd @ 7% O_2) for hydrogen chloride (HCl), hydrogen fluoride (HF), sulfur dioxide (SO_2), carbon monoxide (CO), and nitrogen oxides (NOx);
- Milligrams per dry standard cubic meter, corrected to 7% O_2 (mg/dscm @ 7% O_2) for metals (including cadmium (Cd), mercury (Hg), and lead (Pb)), condensable particulate matter (PM), filterable PM; PM_{10}; $PM_{2.5}$; total PM (including condensables);
- Nanograms per dry standard cubic meter, corrected to 7% O_2 (ng/dscm @ 7% O_2) for dioxin/furans (both totals and specific congeners); and
- Percent (%) for opacity.

If the parameters needed to convert emissions into the standardized units were missing for a particular unit, the assumption was made that the facility reported the pollutant emissions in the desired (standardized) units. Some values, including emissions data reported in units of lb/hr, lb/ton of kiln feed, lb/ton clinker, and zero emissions values were not able to be converted to the standardized units due to the lack of volumetric flow rates and other relevant data. These values are maintained in the database but are not used in the emissions analyses.

3.2.2 Controls and Fuels

Fuel input rates and controls on a per-run basis are needed in the emissions and costing analyses; however, ERT does not track multiple fuel input rates or control devices used during each test run. If a facility submitted emission test results using both the ERT file and the Microsoft ® Excel spreadsheet template, the fuel(s) and control(s) used during the reported ERT test results were assumed to be identical to the fuel and control data reported in the Microsoft ® Excel spreadsheet templates. If the Microsoft ® Excel spreadsheet templates did not provide fuel and control data, or if the facility did not submit any Microsoft ® Excel spreadsheet templates as part of its Phase II test response, the reported test results were assigned using the fuel and control data reported for that unit ICR Phase I survey. For facilities with outlying emissions test data, test reports were reviewed to confirm the fuels and controls installed during the tests.

3.2.3 Fuel Types

Fuel type is reported in 6 tables in the database. To assign CISWI units to a fuel category and analyze data across different fuel types, these reported fuels needed to be standardized across all data tables where fuel type is used to characterize the unit. Table 1 shows each occurrence of

"fuel" in the database and the corresponding standardized fuel field. The reported design capacity fuels were not standardized because they do not necessarily represent the fuels routinely combusted in the CISWI units.

Table 1 - Standardized Fuel Fields

Table	Reported Fuel Field	Standardized Fuel Field
Data: CEMS Backgrnd	TypFuel	Common Fuel
	MaxFuel	Common MaxFuel
Data: EmissionsTest Fuel Data	FuelParameter_Type	Common Fuel
Data: Fuel Analysis	Fuel_Material	Common Fuel
Data: Fuel Analysis Background Information	Fuel_Material	Common Fuel
Data: Materials Combusted	StartupFuel	Common StartupFuel
	Fuel	Common Fuel
	NRC_Fuel	Common NRC_Fuel
Data: Non-Fossil Fuels	NonFossilFuel	Common Fuel

A "common" fuel field was created corresponding to each reported fuel type in the database. The level of detail within the common fuel categories were based on fuel categories provided in Appendix C of the Survey Overview Document[1]. If the reported fuel did not match any of the corresponding fuel categories in Appendix C, a new common fuel category was created.

Fuels were occasionally reported as a mixture of fuels within a single record. Each reported fuel in the mixture was standardized to the format listed in Appendix C of the Survey Overview Document[1], separated by "and" in the standardized fuel field. For example, a reported fuel of "#2 Fuel Oil, kerosene" was standardized to "No. 2 Distillate and Kerosene."

Survey respondents were asked to select a fuel from a series of drop-down lists in the Microsoft ® Excel spreadsheet templates. These templates also allowed respondents to select "other fuel" and enter a description of the type of fuel they combust. In these cases, the description of the fuel type provided by the respondent was used in the database.

3.2.4 Air Pollution Control Devices

Add-on air pollution control devices are reported in the *Data:Control Device* table. Table 2 shows the occurrence of "control device" in the database and the corresponding standardized control device field.

Table 2 - Standardized Control Device Fields

Table	Reported Control Device Field	Standardized Control Device Field
Data: Control Device	ControlDevice	Standardized ControlDevice

The standardized control types were based on the list of control devices provided in the drop down lists in the Survey Answer Key[2]. If the reported control did not match any of the corresponding control devices in the Answer Key, a new control device category was added.

Survey respondents were asked to select a control device from a series of drop-down lists in the Microsoft ® Excel spreadsheet templates. These templates also allowed industry to select "other control device" and enter a description of the control device installed on the unit. In these cases, the description was what was reported as the control type in the database.

Occasionally, combinations of control devices were entered when respondents selected "other control device" from the drop-down list of controls in the Microsoft ® Excel template files. In these instances, each reported control device in the mixture was standardized, with individual control devices separated by "and" in the standardized field.

3.2.5 Standardizations of Reported Emission Test and CEMS Data

The emissions data obtained from test reports and continuous emissions monitoring systems (CEMS) were standardized to provide a common basis for analyzing and comparing emissions data from various CISWI subcategories. To allow for reporting of both non-detect data (with detection limits) and detectable emissions data, all emissions data were imported into the survey results database in a text field format. Numeric fields mirroring the contents of this text field were created to apply mathematical operations to the emissions data and the reported detection limits for non-detect emissions data. These data were reported as text fields due to the format in which non-detect data were reported. Survey respondents were asked to enter the detection limit for a given pollutant and test by enclosing the detection limit in brackets. Any reported data in this format was deemed non-detect and the value inside the brackets was used as the detection limit. Non-detect data were also reported in other formats; therefore, any reported data that included any text other than a numeric value were considered to be "non-detect". For example, if the reported emission value was "ND 0.5," the value was assumed to be non-detect and 0.5 was used as the detection limit.

Some respondents reported an emission value but did not report any units of measurement corresponding to that value. These data points were compared to other data points from the same facility, unit, and pollutant. If there were additional data with reported units of measure and the value without units of measure was of the same order of magnitude, the

assumption was made that the units were consistent. For example, if a combustion unit reported CO emissions to be "10 ppm," "14 ppm," and "12," it was assumed that the "12" was intended to be "12 ppm." If the reported emission value without any units of measure was not within the same order of magnitude, no units of measure were assigned to the data points and those values were not standardized and not used in subsequent analyses.

3.2.6 Heat and Fuel Input Rates

Some emissions data conversion equations for energy recovery units required the heat input or fuel input during the test to be standardized to MMBtu/hr. If emissions were reported as a pollutant mass per unit of time, the total reported heat input during the test run was the preferred conversion parameter. However, if a facility did not report a total heat input value and instead reported fuel input rates, the sum of all standardized fuel input rates were used to convert the emissions test values. Permit limits that required similar conversions were based on the design capacity of the unit and not heat or fuel input rates.

Some emissions data were reported as a mass of emissions per mass of fuel combusted. To standardize these reported values into units of lb/MMBtu, the average higher heating value (HHV) reported in the survey for each fuel listed as an input was needed to convert the emission data. If a combination of fuels was reported, an equally weighted mixture was assumed and the HHV for each constituent fuel was averaged. Sometimes the fuel reported with the design capacity units was a generic "fuel oil" or "coal." Any unspecified specification of fuel oil was assumed to be No. 2 Distillate because it is the most common specification of oil reported to be combusted in the ICR. An unspecified type of coal was assigned the HHV of bituminous coal because it was the most common type of coal reported in the survey. All types of wood were assumed to have the same HHV as was assumed in the Memorandum from Jack Johnson, ERG, to Fred Porter, US EPA[3].

The conversions used to standardize the energy recovery unit fuel and heat input rates are identical to those used to standardize the design capacity of each unit (see Section 3.2.11).

3.2.7 Exhaust Oxygen and Moisture Content

Some emissions data conversions required the amount of O_2 and/or moisture present in the exhaust stream to be standardized to a percent. The 2008 Combustion Survey asked for O_2 and moisture to be reported as percent and it was assumed that all reported values were already in these units since the survey respondent could not specify other units of measure. Values such as "0.05" were assumed to be "0.05%" and not "5%" since the survey specifically asked for units in percent format.

Because a percentage cannot be greater than 100, the O_2 and moisture contents were reviewed to ensure that no reported data were above that threshold. If a facility did not submit O_2 or moisture data, the standardized fields were not populated. Oxygen data were only a survey requirement when reporting carbon monoxide data. If the reported units of measure for other pollutants required an O_2 concentration for standardization, an O_2 concentration of zero percent was used in the conversion calculation.

3.2.8 Exhaust Flow Rate

Some emissions conversions required the exhaust stream flow rate to be standardized to dry standard cubic feet per minute (dscfm). Any reported unit of measure that contained the letter "d" was assumed to be an abbreviation for "dry." Similarly, any reported unit of measure that listed an "s" was assumed to be an abbreviation for "standard." If a unit reported an "s" but no "d" (such as "scfm," an acronym for "standard cubic feet per minute"), the units were corrected for moisture where percent moisture information was available, otherwise the units were assumed to be at dry standard conditions.

3.2.9 Exhaust Temperature

Some emissions conversions required the exhaust stream temperature to be standardized to degrees Fahrenheit (°F). Any standardized temperature greater than 2,000 °F was compared against the other temperatures reported at that facility to identify typographical errors. If the reported temperature was a suspected typographical error, the order of magnitude for the reported and standardized temperature values was reduced to maintain consistency between all data points at that facility. For example, if a facility reported temperatures of "356.746 °F," "359.617 °F" and "364223 °F," the latter was changed to "364.223 °F."

3.2.10 F-Factors

A unique, fuel-specific F-Factor was assigned to each emissions test based on the fuel reported during the test, and that value was used in the standardization of the reported data. A list of all F-Factors used in converting emissions test, CEM and permit data (and the sources from which the F-Factors were found) can be found in the Boiler Survey Results Database, *LOOKUP: F-Factors* table[4].

3.2.11 Capacity

The reported design capacity of each energy recovery unit was standardized to units of million British thermal units per hour (MMBtu/hr) to provide a common basis for analyzing and comparing data from various sizes of units.

First, two data fields called "Standardized Capacity" and "Standardized CapacityUnit" were created in the *Data: Unit Design/Operation* table to hold the standardized design capacity data. These fields were created so as to not overwrite the data originally reported during the standardization process. Additionally, because the reported design capacity was a text-based field the "Standardized Capacity" field was created as a numeric field. This allowed mathematical operations to be applied to the reported design capacities to standardize the parameter to the preferred units of measure. Next, a list was created to identify unique units of measure reported with each design capacity. This list was reviewed to identify and update design capacities without reported units of measure. Missing units of measure were corrected in one of two ways:

- For units that reported a design capacity value but did not report any units, the design capacity was compared to design capacities from other combustion units at the same facility. If additional combustors of a similar size were reported with units of measure and the value was of the same order of magnitude, it was assumed that the units were consistent. For example, if Boiler 1 and Boiler 2 were located at the same facility, and Boiler 1 reported a design capacity of "100 MMBtu/hr" while Boiler 2 reported a design capacity of "120," and did not report any units, it was assumed that the "120" was intended to be "120 MMBtu/hr." In this case, the "Standardized CapacityUnit" field was updated to "MMBtu/hr" while the "Standardized Capacity" field was updated to "120." If a distinction could not be made for the unit with missing units of measure, the "Standardized CapacityUnit" field was updated to "unknown."

- If the user selected units of measure for the design capacity from the survey drop down menu and also provided a note about these units in the field reserved for collecting "other" units of measure, this description was reported as the units of measure in the database. In these cases, the original Microsoft ® Excel templates were reviewed and the correct units of measure were entered in the standardized design capacity and design capacity unit fields.

Design capacities for multiple units at the same facility were compared to find errors conversions (see Standardization of Reported Data from the Questionnaire for Boilers, Process Heaters, Incinerators and Other Combustion Units Memo[5] for discussion on capacity conversions). The total ranges of converted design capacities for each group of reported units of measure were investigated to identify questionable data points. Standardized design capacities greater than 1,800 MMBtu/hr were deemed illogical and the "Standardized CapacityUnit" field was updated to "unknown" for those combustion units.

3.2.12 Subcategories

Under section 129 (a)(2) of the Clean air Act, the Administrator may distinguish among classes, types (including mass-burn, refuse-derived fuel, modular and other types of units), and sizes of units within a category in establishing such standards. The degree of reduction in emissions that is deemed achievable for new units in a category shall not be less stringent than the emissions control that is achieved in practice by the best controlled similar unit, as determined by the Administrator. Emissions standards for existing units in a category may be less stringent than standards for new units in the same category but shall not be less stringent than the average emissions limitation achieved by the best performing 12 percent of units in the category (excluding units which first met lowest achievable emissions rates 18 months before the date such standards are proposed or 30 months before the date such standards are promulgated, whichever is later).

For evaluating alternative standards, CISWI units were subcategorized based on fundamental technical differences and other differences in the processes, such as combustor design, draft type and availability of utilities. The five proposed subcategories that were developed are listed below, followed by an explanation of the reasons for creating each subcategory:

- Incinerators (general waste burning units without integral heat recovery),
- Energy recovery units (waste burning units that recover thermal energy),
- Waste-burning kilns (tire and waste burning kilns),
- Burn-off ovens (small units that clean metal parts), and
- Small, remote incinerators (small incineration units located in remote areas).

Incinerators: Incinerators, which are the units currently regulated by the 2000 CISWI rule, are used to dispose of solid waste materials and emissions are a function of the types of materials burned. Incinerators are designed without integral heat recovery (but may include waste heat recovery). While there are different designs, they all serve the same purpose; reduction in the volume of solid waste materials. Incinerators can be operated on a batch or continuous basis. The same types of add-on controls, including fabric filters, wet scrubbers, selective noncatalytic reduction (SNCR), and activated carbon injection, can be applied to most incinerators. Although the composition of the materials combusted is highly variable and is a key factor in the profile of emissions, we determined it was not appropriate to further subcategorize incinerators because the sources in this subcategory are sufficiently similar such that the incinerators can achieve the same level of performance for the nine regulated pollutants.

Energy-recovery units: Energy recovery units are typically waste-fired boilers and process heaters that combust solid waste materials as a percentage of their fuel mixture and are designed to recover thermal energy in the form of steam or hot water. Energy recovery units are generally larger than incinerators. Energy recovery units typically fire a mixture of solid waste and other fuels, whereas incinerators burn predominantly solid waste, although sometimes a small amount of supplemental fuel is fired in an incinerator to maintain combustion temperature. Energy recovery units are also different from incinerators in terms of how the fuel is fed into the combustion chamber, the combustion chamber design (which typically includes integral heat recovery), and other operational characteristics. These differences can result in emission profiles for energy recovery units that are different from incinerators but similar to boilers. Combustion of waste materials in these units impacts the emissions profile to some degree, although emissions from these units often resemble emissions from boilers that combust traditional fuels.

Waste-burning kilns: Waste-burning kilns are fundamentally different than any other unit being regulated under CISWI. Kilns of all types are physically larger than an incinerator with a comparable heat input. Kiln design and operation are also different. For example, the design is typically a rotating cylindrical kiln with a fuel burner on one end and raw materials being fed in the other (cold) end. Fuel (particularly solids such as tires) may also in some cases be fed at the midpoint of the kiln. Some kilns also have a large preheater tower with a precalciner that is an additional firing point for both fossil and waste fuels. The temperature profile of kilns is critical in order to produce a saleable product. Another key distinction is that for cement kilns, the source of most of the pollutants is typically the raw materials, not the fuels, and emissions from

the raw materials and the solid wastes and fuels are comingled and emitted together. As a result, waste-burning kilns have a very different emissions profile than other CISWI subcategories and that difference can influence the design of applicable controls.

Burn-off ovens: These units typically are very small (<1 MMBtu/hr), batch-operated, combustion units that are used to clean residual materials from various metal parts that are then reused in the process. The amount of waste combusted in these units is generally small (pounds per year in some cases) and the configuration of the stacks that serve these units precludes the use of some EPA test methods for measuring emissions and could affect the ability to install certain control devices.

Small, remote, incinerators: These are batch-operated units that combust less than 1 ton of waste per day and are farther than 50 miles driving distance to the closest municipal solid waste (MSW) landfill. To the extent that these units are located in Alaska, a major difference in these types of units is the inability to operate a wet scrubber in the northern climates and the lack of availability of wastewater handling and treatment utilities. We believe this would impact their ability to meet emission limits for pollutants controlled by wet scrubbers. In addition, because of the remote location, these units do not have lower-cost alternative waste disposal options (i.e., landfills) nearby and emissions associated with transporting the solid waste could be significant.

3.2.13 Fields Added to the database

The "Batch" and "In compliance" fields in the *Data: Emissions Tests* table were added to the database of CISWI units. These fields were populated during stack test extraction when a facility indicated that a unit was either continuously or batch fed with waste material or was in compliance with state or federal permit limits.

The "lat" and "lon" (i.e. latitude and longitude) fields in the Data:Facility were also added to the CISWI unit database. These fields were populated using the physical address provided by the facility along with TeleAtlas's Geocoder USA_Geo_002 service.[6] Addresses that were not found in the geocoder were searched in http://www.earthpoint.us/Townships.aspx, Google Earth, and batchgeocode.com to find the appropriate latitude and longitude coordinates.

4.0 References

1. *Questionnaire for Boilers, Process Heaters, Incinerators and Other Combustion Units: Survey Overview*. OMB Control No. 2060-0616, http://survey.erg.com/ss/wsb.dll/s/7g8d

2. *Questionnaire for Boilers, Process Heaters, Incinerators and Other Combustion Devices: Answer Key.* OMB Control No. 2060-0616, http://survey.erg.com/ss/wsb.dll/s/7g8d

3. Memorandum from Jack Johnson, ERG, to Fred Porter, EPA/ESD, *Emissions Data Conversions And Calculations in the ICCR Emissions Test Database*. June 25, 1999.Survey

4. Results Database, *Survey Database containing Results of the 2008 Questionnaire for Boilers, Process Heaters, & Other Combustion Units (ICR No. 2286.01).*

5. Memorandum from Amanda Singleton and Graham Gibson, ERG, to Jim Eddinger, U.S. Environmental Protection Agency, OAQPS, *Standardization of Reported Data from the Questionnaire for Boilers, Process Heaters, Incinerators and Other Combustion Units.* April, 2010.

6. TeleAtlas's Geocoder USA_Geo_002 service, http://www.geocode.com/documentation/USA_Geo_002.pdf

7. Memorandum from Jason Huckaby, Amber Allen, Kristen James, Eastern Research Group, Inc, to Charlene Spells, Toni Jones, Ketan Patel, U.S. Environmental Protection Agency, *Compliance Cost Analyses for CISWI Units Table 4C.* April 28, 2010.

Appendix A: CISWI Database Contents

Table Type	Data Table Name	Contents
Data	CEMS	CEMS data for CO, NOx, SO_2, and PM.
Data	CEMS Backgrnd	Background information for continuous emissions monitoring data for CO, NOx, SO_2, and PM.
Data	Emissions Tests	Emissions test data for dioxin/furans (both totals and specific congeners); 15-, 16-, and 7-PAH; acetaldehyde; antimony; arsenic; benzene; barium; beryllium; cadmium; chlorine; chromium; CO; cobalt; copper; formaldehyde; hexavalent chromium; HCl; HF; Pb; manganese; mercury; nickel; NOx; filterable PM; PM_{10}; $PM_{2.5}$; condensable PM; total PM (including condensables), phosphorus; selenium; silver; SO_2; thallium; toluene; total hydrocarbons; xylenes; and zinc.
Data	EmissionsTest Background Info	Background information for the Emissions Tests table.
Data	Emissions Test and CEMS Installed	Background information including start up fuel types and emission test locations for data included in the Emissions Tests and CEMS tables.
Data	EmissionsTest Fuel Data	Information on fuel types related to the Emissions Tests table.
Data	PaintAnalysis	Additional information submitted by facilities with burn off ovens during ICR Phase II where the paint analysis information that did not fit into a template file.
Lookup	TEF Values	Toxic Equivalent Factors (TEF) used to convert dioxin/furan emissions data from TEQ into total mass basis.
Data	Control Device	Information on the type of control device in place related to the units listed in the Unit Design/Operation table.
Data	Facility	Contact information and latitude/longitude coordinates for all facilities in the database.
Data	FuelAnalysis	Information on the types of fuels burned in the CISWI units.
Data	FuelAnalysis Background Information	Background information on the fuel types listed in the FuelAnalysis table.
Data	GCP and CombustionControls	Background information on GCP and combustion controls related to the units listed in the Unit Design/Operation table.
Data	Incinerator Control Devices	Information on the type of control device in place related to the units listed in the Incinerator table.
Data	Incinerator Waste Management	Information on the type of waste related to the units listed in the Incinerator table and provides information on alternative waste management systems available and the cost as applicable.

Appendix A: CISWI Database Contents

Table Type	Data Table Name	Contents
Data	Incinerator	The units classified as incinerators in the database and background information on these units including model type, capacity, and hours operated per year. Units listed in this table are further subcategorized as 'Incinerators,' 'Burn-Off Ovens,' 'Air Curtain Incinerators,' 'Waste-burning Kilns,' and 'Small, Remote' units (see Subcategorization Memo.)
Data	Materials Combusted	Information on the type of materials combusted related to the units listed in the Unit Design/Operation table.
Data	Non-Fossil Fuels	Information on the type of non-fossil fuels burned related to the units listed in the Unit Design/Operation table.
Data	Regulatory and Permit Limits	Local, state, and federal information on individual pollutant emission limits.
Data	Stack	Background stack information for units listed in the Unit Design/Operation table including whether the stack is a single, common, or multiple stack.
Data	Unit Design/Operation	The units subcategorized as Energy Recovery Units in the database and background information on these units including capacity, operating hours, and size classifications.
Lookup	CISWI Control Device Look Up	List of all the facilities and combustion unit IDs contained in the database with their associated subcategory and control device.

Appendix B: Data Conversion Table

Variable	From	To	Data Required	Constants	Conversion Equation
Pollutant emission	lb/hr	mg/dscm	flow rate (dscm/m)	453.592 g/lb 60 m/hr 1000 mg/g	(mg/dscm) = (lb/hr)*453592/(60*dscm/m)
	gr/dscf	mg/dscm	(applies to PM)	7000 gr/lb 35.31 ft3/m3 453592 mg/lb	(mg/dscm) = (gr/dscf)*35.31*453592/7000
	lb/MMBtu	mg/dscm	F-Factor[7]		(mg/dscm) = ((lb/MMBtu)/(F-Factor))*35.31*453592
	mg/dscm	ppmvd	Molecular Weight (MW): NO2 = 46 lb/mol CO = 28.01 lb/mol SO2 = 64.06 lb/mol HCl = 36.45 lb/mol HF = 20.01 lb/mol	.041552 mg/dscm (@ 7% O2 and 68ºF)	(ppmvd) = (mg/dscm)/(0.041552*(MW))
	ppmvd	mg/dscm			(mg/dscm) = 0.041552*(MW)*(ppmvd)
	mg/dscm	ng/dscm			(ng/dscm) = (10^6)*(mg/dscm)
	ppmv	ppmvd	moisture (%H2O)		(ppmvd) = (ppmv)*100/(100 - %H2O)
	at X%O2	at 7% O2	O2 content (%O2)		(at 7% O2) = (at X%O2)*(20.9 - 7)/(20.9 - %O2)
Flow rate	dscf/m	dscm/m		35.315 ft3/m3	(dscm/m) = (dscf/m)/35.315
	scf	dscf	moisture (%H2O)		(dscf) = (scf)*(100 - %H2O)/100

[7] F-Factors for each unit are dependent on the fuel type combusted. Refer to Table 4C in the Compliance Cost Analyses for Existing CISWI Units Memo[7] for a list of assigned F-Factors